Amendments to the Drawings:

The attached sheet of drawings include changes to FIGS. 1 and 2. These replacement sheets replace original sheet 1 filed with the application. The changes are the addition of the legend "PRIOR ART" to FIG. 1 and the removal of the hatching in FIG. 2 as described in detail in the Remarks section of this Amendment.

Attachment: One (1) replacement sheet for FIG. 1 and 2

REMARKS/ARGUMENTS

Before the present amendment, Claims 1-7 were pending, with Claims 1 and 3 being in independent form. In the present amendment, Claims 1-7 have been amended for clarity and proper form (in accordance with U.S. patent practice) and Claim 8-20 have been added. After the present amendment is entered, Claims 1-20 will be pending, with Claims 1, 3, and 18 being in independent form. Reconsideration and withdrawal of the rejections are requested on the basis of the foregoing amendments and the following remarks.

In the Office Action dated 17 June 2003:

I. The disclosure was objected to for informalities;

II. The drawings were objected to for informalities;

III. Claims 1-7 were rejected under 35 U.S.C. §112, second paragraph, for indefiniteness;

IV. Claims 1 and 3 were rejected under 35 U.S.C. §102(b) as anticipated by *Murata* (European Pat. App. No. 858 123);

V. Claims 2 and 4-6 were rejected under 35 USC §103(a) as unpatentable over *Murata* in view of *Kyocera* (European Pat. App. No. 883 328); and

VI. Claim 7 was rejected under 35 USC §103(a) as unpatentable over *Murata* in view of *King* (US 2,232,179).

I. Objection to the disclosure for informalities

The Examiner objected to the word "ordinary" in the brief description of FIG. 1 on page 4; the word "presently" in the heading for the detailed description; and noted that the phrase "(not shown in FIG. 4)" should follow the word "plane" on lines 19 and 27 of page 7. In response, the word "ordinary" has been replaced with "prior art" as suggested by the Examiner; the word "presently" has been removed from the heading as suggested by the Examiner; and the phrase "(not shown on FIG. 4)" has been added after the two specified occurrences of the word "plane" on page 7 as suggested by the Examiner. Withdrawal of the rejection is respectfully requested.

The Examiner also objected to the fact that certain reference labels needed an explicit description in the disclosure. Specifically, the Examiner wanted explicit descriptions of the label

"ϵ_r", in FIGS. 2-4, 5A-5C, and 6A-6B, and the labels "G", "S", "λ/4", "65A", "64B", and "65B" in FIGS. 6A-6B.

The symbol "ϵ_r", in FIGS. 2-4, 5A-5C, and 6A-6B is first defined as "permittivity" in the last lines of page 1 of the specification. Afterwards, the description of FIG. 2, in the last paragraph on page 5, discusses the "permittivity ϵ_r of the ceramic material" and a similar description is given in the passage describing FIG. 3 on page 6 (at lines 24-31). After that, the description of "ϵ_r" is assumed for the following drawings. In essence, the legend ϵ_r in the drawings represents the fact that all of the ceramic material has the same permittivity ϵ_r, i.e., all the ceramic material is labeled "ϵ_r" to indicate they all have the same ϵ_r.

The symbols "G" and "S" in FIG. 6A are acting as additional legends for "ground conductor 62a" and "signal conductor 63a", respectively, as described in the last paragraph of page 9. They were added so that one could quickly identify the two conductors without having to look up "63a" and "62a" in the specification. We have added the legends "G" and "S" where the signal and ground conductors are first described in the specification. If that is unacceptable to the Examiner, we could, in the alternative, delete the symbols from FIG. 6A, since the ground and signal conductors are already identified with the legends "62a" and "63a", respectively.

The value "λ/4" in FIGS. 6A and 6B is the length indicated by the double-headed arrow underneath it; i.e., the length of the "step", as indicated by the double-headed arrow, is λ/4. This is stated at lines 35-36 on page 9 of the specification: "[The quarter-wave transformer] consists of steplike changes of the waveguide geometry of the length of λ/4 in the direction of the z-axis in the drawing".

The label "64b" in FIG. 6B is for vias, as is described at line 19 of page 10.

The labels "65a" and "65b" in FIGS. 6A and 6B are for the layer of conductive material on the bottom of the waveguide core, in a similar manner as "55a", "55b", and "55c" of FIGS. 5A, 5B, and 5C. To clarify this, we have added that description to the paragraphs describing FIGS. 6A and 6B on pages 9 and 10.

With these amendments, it is believed that the §112, second paragraph, rejections are overcome. Withdrawal of the rejection is respectfully requested.

II. Objection to the drawings for informalities

The Examiner objected to the drawings: specifically, FIG. 1 should be labeled "PRIOR ART" and all dielectric materials in FIGS. 2 and 3 should be properly cross-hatched. In response,

the label "PRIOR ART" has been added to FIG. 1.

In a teleconference between the Examiner and the undersigned attorney on October 28, 2003, the cross-hatching and other matters concerning the drawings were discussed. has been added the dielectric material to FIGS. 2 and 3.

However, applying such cross-hatching to the dielectric material (i.e., all of the ceramic) in FIG. 3 is problematic. It was decided that using cross-hatching on all dielectric material may be too confusing in combination with the other markings used in the other drawings. FIGS. 2, 3, and 5A-5C are perspective drawings, showing the three dimensions of height, length, and width (y, z, and x, respectively), and FIGS. 3, 5A, and 5C also have a "see-through" view of the inside of the core of the waveguide in order to show the two rows of vias in FIG. 3, the cylindrical hole and inserted probe therein in FIG. 5B, and the hole and coupling loop inserted therein in FIG. 5C. The use of cross-hatching on the outside flat surfaces of the waveguide core in FIGS. 3, 5A, and 5C would likely obscure the inside structures being shown.

Therefore, it was decided to remove any markings on the outside of FIG. 2 in order to make the drawings consistent, i.e., none of the drawings have markings indicating dielectric material. Instead, as discussed in Sect. I above, the symbol ϵ_r is used to label the ceramic material in all of the drawings (in contrast to the "air" in the drawings).

There are horizontal lines shown on the flat surface of FIG. 3 and on the cross-sections in FIGS. 4 and 6A-6B. In each of these drawings, the horizontal lines represent the same thing: – layers of ceramic material. .This is pointed out explicitly in the description of FIG. 4, on lines 16-17 of page 7 ("The ceramic circuit structure is assembled by layers of ceramic plates/strips 41"), the description of FIG. 6A on lines 25-26 of page 9 ("The circuit structure has been implemented by joining together several layers of ceramic plates 61a"), and the description of FIG. 6B on lines 8-9 of page 10 ("The circuit structure has been implemented by joining together several layers of ceramic plates 61b").

Applicants respectfully request that the objection be withdrawn. If the Examiner finds the applicants' solutions unacceptable, applicants respectfully request any suggestions the Examiner may have in this matter to clarify the situation.

III. Rejection of Claims 1-7 under §112, second paragraph

The Examiner rejected Claims 1-7 under 35 U.S.C. §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as

the invention. Specifically, the phrase "the multilayer ceramic technique" in Claims 1 and 3 lacked antecedent basis; the phrases "structural directions" and "the permittivity ϵ_r of which" in Claims 1 and 3 were unclear; it was unclear which one of the plural circuit units was being referred to by "the circuit unit" in Claim 3; the phrase "in first surface of the waveguide" in Claims 5-7 lacked strict antecedent basis; and, finally, the Examiner suggested replacing the word "which" throughout the claims with the word "said".

In response, the claims have been rewritten in the present amendment in order to clarify the nature of the present invention. Withdrawal of the rejection is respectfully requested.

IV. Rejection of Claims 1 and 3 as anticipated under §102(b) by *Murata*

The Examiner rejected Claims 1 and 3 under 35 U.S.C. §102(b) as anticipated by *Murata*. As mentioned above, the claims have been re-written for reasons of clarity. It is believed that the originally-filed claims, even if not entirely clear, were nonetheless patentable over *Murata*. In any case, the re-written claims will clarify the patentable distinctions between the claimed invention and the cited prior art, as will be discussed below.

Murata describes a parallel plate waveguide. In FIGS. 1 and 2, we see the ceramic sheets in *Murata* being put together. In FIG. 1 of *Murata*, there are several inner ceramic layers 1 sandwiched between two outer layers 2. Each inner layer is comprised of a high-dielectric center strip 3 surrounded by low dielectric material 4, and each outer layer is comprised of uniform dielectric material. In FIG. 2 of *Murata*, we see the layers of FIG. 1 sandwiched together between two electrodes 5. The two electrodes 5 form two parallel electrically conductive plates, and the dielectric strip 3 serves as the propagating area for the waveguide.

In contrast, amended independent Claims 1 and 3 of the present invention recite a rectangular waveguide in which a waveguide core is surrounded on its sides by two air-filled channels extending the length of the waveguide, and on its top and bottom by a layer of conductive material. The two layers of conductive material are limited to the core of the waveguide, i.e., they do not extend into, around, or above the two air-filled channels (" ... wherein said conductive first and second planes are defined between said two air-filled channels ... " in Claim 1; " ... wherein said top and bottom layers are defined between said two air-filled channels ..." in Claim 3).

An exemplary embodiment of the invention claimed in Claims 1 and 3 is shown in FIGS. 3 and 4 of the present application. In FIGS. 3 and 4, two air-filled channels 32 (42 in FIG. 4) and 36 (46) are on both sides of, and thus define, waveguide core 33 (43), a layer of conductive material 34

(44) is on top of the waveguide core 33 (43), and a layer of conductive material 35 (45) is on the bottom of the waveguide core 33 (43). The air-filled channels 32,36 (42,46) are also on both sides of, and thus define, the layers 34,35 (44,45) of conductive material on the top and bottom of the waveguide core 33 (43), as can be clearly seen in the cross-section of FIG. 4.

The two air-filled channels surrounding the waveguide core, as recited in amended Claims 1 and 3, are not found, either expressly or inherently, in *Murata*. *Murata* does punch a pattern of "holes" in the ceramic sheet in order to create a lower dielectric material, but these are not "air-filled channels" which extend the length of the waveguide core, nor do they serve to completely isolate the waveguide core from the surrounding ceramic material. In addition, the holes of *Murata* serve a completely different purpose: turning one area of ceramic sheet into a lower dielectric than the remaining areas.

Furthermore, because *Murata* is a parallel plate waveguide, instead of a rectangular waveguide as recited in the independent claims of the present application, *Murata*'s layers of conductive material on the top and bottom of the waveguide are not defined, or limited, to the width of the waveguide core, but extend substantially beyond the waveguide core. *See* electrode layers 5 in FIG. 2 of *Murata* on both sides of waveguide core 3 (shown in both FIGS. 1 and 2 of *Murata*) and compare with conductive layers 44,45 on the top and bottom of waveguide core 43 in FIG. 4 of the present application. This is because parallel plate waveguides operate differently than rectangular waveguides. Specifically, the regions surrounding the waveguide core in between the electrodes in a parallel plate waveguide (whether air-filled or not) are **not** for the purpose of isolating energy within the waveguide core; by contrast, such isolation is the exact purpose of the two air-filled channels in the rectangular waveguide of Claims 1 and 3.

At least because *Murata* neither teaches nor suggests "two air-filled channels extending the length of the waveguide", where said air-filled channels define the waveguide core, and where the conductive layers on the top and bottom of the waveguide core are also limited by the air-filled channels, which limitations are recited in independent Claims 1 and 3 of the present application, Claims 1 and 3 are neither anticipated by, nor are unpatentable over, *Murata*. Withdrawal of the rejection is respectfully requested.

V. Rejection of Claims 2 and 4-6 as anticipated under §102(b) by *Murata* and *Kyocera*

The Examiner rejected dependent Claims 2 and 4-6 under 35 USC §103(a) as unpatentable over *Murata* in view of *Kyocera*. At least because Claims 2 and 4-6 depend from independent

Claims 1 and 3, respectively, which are believed to be patentable, it is believed Claims 2 and 4-6 are patentable as well; withdrawal of the rejection is requested at least on that basis.

As was noted above, the claims have been extensively re-written for reasons of clarity. It is believed that the originally-filed claims, even if not entirely clear, were nevertheless patentable over the combination of *Murata* and *Kyocera*. The re-written claims clarify the patentable distinctions between the claimed invention and the cited prior art.

Furthermore, it should be noted that *Kyocera* neither teaches nor suggests "two air-filled channels extending the length of the waveguide", where said air-filled channels define the waveguide core, and where the conductive layers on the top and bottom of the waveguide core are also limited by the air-filled channels, which limitations are recited in independent Claims 1 and 3 of the present application. At least because the combination of *Murata* and *Kyocera* neither teaches nor suggests these limitations, which are recited in independent Claims 1 and 3 of the present application, Claims 1 and 3 are patentable over the combination of *Murata* and *Kyocera*. Withdrawal of the rejection is respectfully requested on this additional basis..

VI. Rejection of Claims 2 and 4-6 as anticipated under §102(b) by *Murata* and *King*

The Examiner rejected dependent Claim 7 under 35 USC §103(a) as unpatentable over *Murata* in view of *King*. As was demonstrated above, independent Claim 3, upon which Claim 7 depends, is patentable; at least for that reason, Claim 7 is also patentable. Withdrawal of the rejection of Claim 7 is respectfully requested on either basis stated in this section.

Addition of Claims 8-20

Dependent Claims 8-17 have been added in this Amendment, as well as independent Claim 18, with Claims 19-20 dependent thereon.

None of these claims contain new matter: Claim 8 is based on material at least at lines 30-38 on page 2 of the originally filed specification; Claim 9 is based on material at least at lines 30-38 on page 7 of the originally filed specification; Claim 10 is based on material at least at lines 1-5 on page 2 and lines 12-21 on page 6 of the originally filed specification; Claims 11 and 12 are based on material at least at page 5, line 30, to page 6, line 3, as well as Claims 1 and 3 of the originally filed specification; Claim 13 is based on material at least at lines 5-7 on page 6 of the originally filed specification; Claims 14 and 19 are based on material at least on FIGS. 3 and 4 and in the description thereof at page 6, line 10, to page 8, line 8 of the originally filed specification; Claims 15

and 16 are based on material at least at lines 10-15 of page 7 of the originally filed specification; Claims 17 and 20 are based on material at least on FIGS. 6A and 6B and in the description thereof at page 9, line 23, to page 10, line 22 of the originally filed specification; and Claim 18 is based on material at least in the originally-filed claims of the present application.

At least through their dependence on amended independent Claim 1, which is believed to be in condition for allowance, newly-added dependent Claims 8-17 are also believed to be in condition for allowance, which is respectfully requested. Newly-added independent Claim 18 is believed to be in condition for allowance for at least the same reasons given above for the allowance of amended independent Claims 1 and 3. Allowance of Claim 18 is respectfully requested. At least through their dependence on newly-added independent Claim 18, which is believed to be in condition for allowance, newly-added dependent Claims 19-20 are also believed to be in condition for allowance, which is respectfully requested.

Respectfully submitted,

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